



LOAD IMPACT EVALUATION OF AGGREGATOR DEMAND RESPONSE PROGRAMS: CBP AND AMP

2017 DRMEC Load Impact Workshop • May 8, 2017

Kelly Marin, Project Director

Energy solutions. Delivered.

AGENDA



- Program Descriptions
- Ex Post Methodology
- Ex Post Impacts
- Ex Ante Methodology
- Enrollment Forecast
- Ex Ante Impacts
- Ex Post and Ex-Ante Comparison
- Key Findings

PROGRAM DESCRIPTION

Capacity Bidding Program (CBP)

- **IOUs:** PG&E, SCE, and SDG&E
- **Program Basics:**
 - Statewide aggregator-managed DR program
 - Operates May-Oct for PG&E and SDG&E and year-round for SCE
 - Participants must meet eligibility requirements
 - Participants receive monthly capacity payments based on nominated load + energy payments based on kWh reductions during events
 - Capacity payment may be adjusted based on performance
 - Participants receive monthly the capacity payment according to their nomination if no events called
 - Dual enrollment in energy-only DR program with a different notification type is allowed
- **Events:**
 - Triggered by IOU or CAISO market award
 - Day-ahead (DA) and day-of (DO) notice options
 - Event durations of 1-4 and 2-6 hours in 2016 and forecast
 - Up to 30 event hours/month SCE and PG&E; 44 hours/month for SDG&E
 - 11 a.m. to 7 p.m. non-holiday weekdays

PROGRAM DESCRIPTION

Capacity Bidding Program (CBP)

- **Program Changes:**
 - Portfolios in process of integrating into CAISO wholesale energy market
 - PY2016 and PY2017 – transition years
 - IOUs proposed program changes – several approved in June 2016; changes begin in PY2017
 - PG&E CBP: Tariff changes to increase incentive levels
 - SCE CBP: Streamlining to two products, increasing capacity prices, reducing # of events
 - SDG&E: Changes to improve integration
 - IOUs filed advice letters proposing including energy price component to CBP heat rate trigger
 - Awaiting Commission resolution

PROGRAM DESCRIPTION

Aggregator Managed Portfolio (AMP)

- **IOUs:** PG&E and SCE
- **Program Basics:**
 - 3rd party aggregators contract with IOUs
 - Aggregators create own DR programs and contract with customers
 - Operated May-Oct for PG&E and varies for SCE
 - Customers must meet eligibility requirements
 - PG&E: system and local products; local allows dispatch by Sub-LAP
 - SCE: system and local dispatch pre-integration; dispatch by Sub-LAP post-integration
 - Penalties for not delivering committed load reduction
 - Customers may dually enroll in other DR programs (CPP, PDP, DBP, OBMC)
- **Events:**
 - Triggered by IOU or CAISO market award
 - Only DO notification contracts in 2016 and forecast
 - Up to 76 event hours/year for PG&E; varies for SCE
 - 11 a.m. to 7 p.m. non-holiday weekdays for PG&E; varies for SCE

PROGRAM DESCRIPTION

Aggregator Managed Portfolio (AMP)

- **Program Changes:**
 - PG&E: AMP was discontinued at end of PY2016
 - SCE: CPUC Decision 16-06-029 authorized AMP to continue through PY2017

CONFIDENTIALITY



- A lot of the impacts for PG&E and SCE are confidential this year
- Redactions are compliant with the 15/15 Rule (*PUC § 583 D. 14-05-016*)
 - Fewer than 15 customers in a group or subgroup
 - One customer makes up more than 15% of the total load in a group or subgroup
- Information is also redacted if there is only one aggregator in the group or subgroup (*General Order 66-C, Section 2.2(b) D.06-06-066*)
- The purpose of the redactions is to protect customer and/or aggregator confidentiality
- SDG&E shows all program level impacts
 - This is a result of new guidance from their SDG&E attorneys concluding that program level impacts are not confidential.

EX POST IMPACTS

Program Dispatch and Event Summary



Program	IOU	Day-Ahead			Day-Of		
		Number of event days	Hours of Availability	Actual Hours of Use	Number of event days	Hours of Availability	Actual Hours of Use
CBP	PG&E	16	180	55	19	180	69
	SCE	57	360	158	98	360	240
	SDG&E	14	264	56	7	264	28
AMP	PG&E	-	-	-	14	76	60
	SCE	-	-	-	7	76	23

- PG&E: Number of 2016 event days were comparable to 2015
- SCE: 7 CBP DA events and 46 CBP DO events were called during winter months; number of 2016 CBP DO event days was more than double 2015 value
- SDG&E: ~1/3 as many event days in 2016 compared with 2015

EX POST IMPACTS

Average Summer Event, Average Event Hour



Program	IOU	Day-Ahead			Day-Of		
		Aggregate Impact (MW)	Nominated Capacity (MW)	Event Temp (°F)	Aggregate Impact (MW)	Nominated Capacity (MW)	Event Temp (°F)
CBP	PG&E	Confidential		89	9.2	12.0	88
	SCE	Confidential		92	Confidential		91
	SDG&E	3.4	4.0	79	4.7	3.9	84
AMP	PG&E	-	-	-	64.9	76.3	94
	SCE	-	-	-	Confidential		94

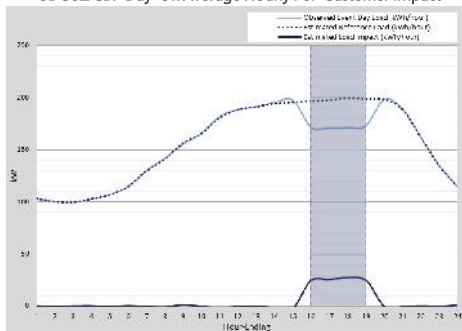
- PG&E CBP and AMP aggregate impacts fell short of nominated capacity
- SCE CBP aggregate impact exceeded nominated capacity
- SDG&E CBP DA aggregate impact fell short of nominated capacity, while DO aggregate impact exceeded nominated capacity
- CBP DO aggregate impact were higher than DA impacts
- AMP aggregate impacts were higher than CBP impacts

EX POST IMPACTS

Example Load Profiles and Impacts

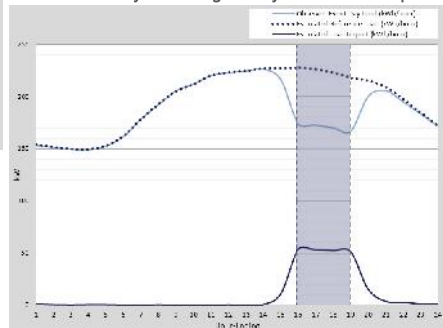


SDG&E CBP Day-Of: Average Hourly Per-Customer Impact



Average Summer Event Day 2016

PG&E AMP Day-Of: Average Hourly Per-Customer Impact



EX POST IMPACTS

Utility System Peak Hour



Program	IOU	Day-Ahead		Day-Of	
		Aggregate Impact (MW)	Event Temp (°F)	Aggregate Impact (MW)	Event Temp (°F)
CBP	PG&E	<i>Confidential</i>	92	10.6	92
	SCE	<i>Confidential</i>	101	14.1	99
	SDG&E	9.3	97	7.6	97
AMP	PG&E	-	-	78.0	97
	SCE	-	-	<i>Confidential</i>	

Results are for the 2016 utility system peak hour.

- Weather across all three utilities is similar, but slightly lower for PG&E's CBP
- PG&E's AMP program has the highest impact at 78 MW
- PG&E's Peak: 7/27/2016 (HE 18); SCE's Peak: 6/20/2016 (HE 17); SDG&E's Peak: 9/26/2016 (HE 17)

EX POST IMPACTS

Statewide System Peak Hour



Program	IOU	Day-Ahead		Day-Of	
		Aggregate Impact (MW)	Event Temp (°F)	Aggregate Impact (MW)	Event Temp (°F)
CBP	PG&E	<i>Confidential</i>	92	11.6	92
	SCE	<i>Confidential</i>	93	<i>Confidential</i>	92
	SDG&E	0.9	77.5	-	-
AMP	PG&E	-	-	78.3	97
	SCE	-	-	<i>Confidential</i>	-

Results are for the 2016 statewide system peak hour.

- Impacts range from <1 MW to 78 MW
- PG&E's AMP program has the highest impact at 78 MW
- CAISO Peak: 7/27/2016 (HE 17)

EX ANTE IMPACTS

Methodology

- Use customer-specific regression models from ex post analysis
- Predict per-customer weather-adjusted impacts for all subgroups
 - Apply Utility and CAISO weather scenarios
- Use enrollment forecasts from IOUs to forecast aggregate impacts
 - Enrollment was derived based on
 - 2016 ex post per-customer impacts
 - Contractual MW
 - Historical performance

EX ANTE IMPACTS

Enrollment Forecast, Month of August

Number of Service Accounts												
Program	Utility	Notice	2017	2018	2019	2020	2021	2022-2027 (each year)				
	PG&E	DA	50						50			
		DO	611						611			
CBP	SCE	DA	30	90					90			
		DO	814	1,250					1,250			
	SDG&E	DA	70	70	+3%	72	+3%	74	+3%	76	+3%	78
		DO	199	199	+10%	219	+10%	241	+10%	265	+10%	292
AMP	SCE	DO	<i>Confidential</i>	-	-	-	-	-	-			

Drivers

- PG&E forecasts steady CBP enrollment throughout forecast horizon. AMP was discontinued at end of 2016.
- SCE forecasts no AMP accounts after 2017 and an increase in enrollment for CBP DO beginning in 2018 due to elimination of AMP.
- SDG&E forecasts CBP DA and DO enrollment will increase 3% per year (2019-2022) due to program improvements, and CBP DO will increase by another 7% per year (2019-2022) due to growth in TI program. The forecast between 2022 and 2027 is flat.

EX ANTE IMPACTS

Average Event Hour, August Peak Day 2017

Program	Utility	Notice	Accounts	Utility Peak 1-in-2	
				Per-Customer Impact (kW)	Aggregate Impact (MW)
CBP	PG&E	DA	50	138.1	6.9
		DO	611	22.2	13.6
	SCE	DA	30	52.8	1.6
		DO	814	36.1	29.3
	SDG&E	DA	70	13.0	0.9
		DO	199	25.5	5.1
AMP	SCE	DO	<i>Confidential</i>		

- Overall, CBP DO 2017 ex ante impacts are higher than 2016 ex post impacts due to expected enrollment migration from AMP DO

EX ANTE IMPACTS

Comparison of current and previous forecast

Program	Utility	Notice	Previous Forecast, 2017		Current Forecast, 2017		
			Accounts	Aggregate Impact (MW)	Accounts	Aggregate Impact (MW)	
CBP	PG&E	DA	175	21.2	50	6.9	↓
		DO	609	17.1	611	13.6	↓
	SCE	DA	30	1.2	30	1.6	↑
		DO	814	30.2	814	29.3	↓
	SDG&E	DA	122	7.7	70	0.9	↓
		DO	220	4.6	199	5.1	↑
AMP	SCE	DO	<i>Confidential</i>				

Results are average event-hour impacts for August peak day in 2017; Utility Peak 1-in-2 weather conditions.

- CBP DA
 - PG&E decrease – lower enrollment expected
 - SCE increase – higher per-customer impacts expected
 - SDG&E decrease – lower per-customer impacts and lower enrollment expected
- CBP DO
 - PG&E decrease – lower per-customer impacts expected
 - SCE comparable between current and previous forecast
 - SCE slight increase – higher per-customer impacts expected

KEY FINDINGS

Ex Post Analysis



On average event day

- Impacts relative to nominated capacity
 - PG&E: CBP and AMP aggregate impacts fell short of nominated capacity
 - SCE: CBP aggregate impact exceeded nominated capacity
 - SDG&E: CBP DA aggregate impact fell short of nominated capacity, while DO aggregate impact exceeded nominated capacity
- Notice type
 - DO products had higher enrollment and greater aggregate impact than DA products
- Program type
 - AMP programs had significantly higher enrollment and greater aggregate impacts than CBP
- Comparison with 2015
 - CBP enrollment and aggregate impacts were lower in 2016 than 2015 for all IOUs

KEY FINDINGS

Ex Ante Analysis



On August 2017 peak day

- Enrollment forecast
 - PG&E and SDG&E: current CBP enrollment forecast for 2017 is lower than previous
 - SCE: forecasts a significant increase in enrollment for CBP after 2017 when AMP ends
- Aggregate impacts
 - PG&E and SDG&E: CBP aggregate impacts decrease
 - SCE: CBP aggregate impacts increase
- While we see a fluctuation in per customer impacts across years, and across a single season, aggregate impacts are driven largely by nominated MW



Table Generator Guided Tour

PROJECT CONTRIBUTORS



IOU Contributors

Gil Wong, PG&E
Overall Project Manager
GxWf@pge.com

Lizzette Garcia-Rodriguez, SDG&E
SDG&E Project Manager
LGarcia-Rodriguez@semprautilities.com

Edward Lovelace, SCE
SCE Project Manager
Edward.Lovelace@sce.com

AEG Contributors

Kelly Marrin
Project Director
kmarrin@appliedenergygroup.com

Kelly Parmenter
Project Manager
kparmenter@appliedenergygroup.com

Abigail Nguyen
Analysis Lead
anguyen@appliedenergygroup.com

Anthony Duer
Senior Analyst
aduer@appliedenergygroup.com

